



CEOS Working Group on Calibration and Validation

Land Product Validation Subgroup

Vegetation Index Focus Area Workshop

10:30 – 18:00, Wednesday, 12 December 2018
Cambria Hotels & Suites Washington, D.C., USA

VI & LSP Workshop

Fort Collins, CO, USA, November 9-10, 2016



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A Summary of Vegetation Index & Land Surface Phenology Focus Area Workshop

- The workshop was held with the following two goals:
 - 1) Initiating the development of validation protocols for Vegetation Indices and Land Surface Phenology products.
 - 2) Develop a strategy to advance the validation stage of one or more operational Land Surface Phenology Products and one or more Vegetation Index Products
- The first day was used for the participants to provide
 - (1) an overview of current and future satellite vegetation index (VI) products and land surface phenology (LSP) products;
 - (2) select use-case studies of VI and/or LSP products; and
 - (3) an overview of select ground reference data available and deemed appropriate for VI and LSP validation.
- The second day was used to discuss potential validation strategies and develop action plans. The participants were first divided into two groups, one for LSP and the other for VIs, for the sub-group discussions. Then, the whole group got back together to review and determine action plants later on the day.

What to Accomplish at the Last Workshop?

(9-10 November 2016, Fort Collins, USA)

- What accuracy/uncertainty information the users wish for VI products
 - Accuracy and/or uncertainty expressed in VI units (e.g., ΔNDVI)
 - Changes in VI values vs. changes in actual vegetation condition/status
- What accuracy/uncertainty level the users wish for VI products
- What validation activities/infrastructures are needed, given the CEOS validation definition
 - What protocols are acceptable
 - What set of sites can serve as 'fiducial sites'
 - What set of sites fulfill a global representativeness

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Vegetation Index (VI) Focus Area Group

- Participants identified three components of VI validation were needed:
 - 1) Uncertainty of VIs in their units (e.g., Δ NDVI)
 - 2) VI sensitivity to vegetation biophysical/physiological conditions
 - 3) Long-term stability of VI time series data
- Potential data sources for VI validation were identified:
 - NEON airborne hyperspectral data
 - AERONET-based surface reflectance data
 - Ground-/drone-observational reflectance data
 - FLUXNET data

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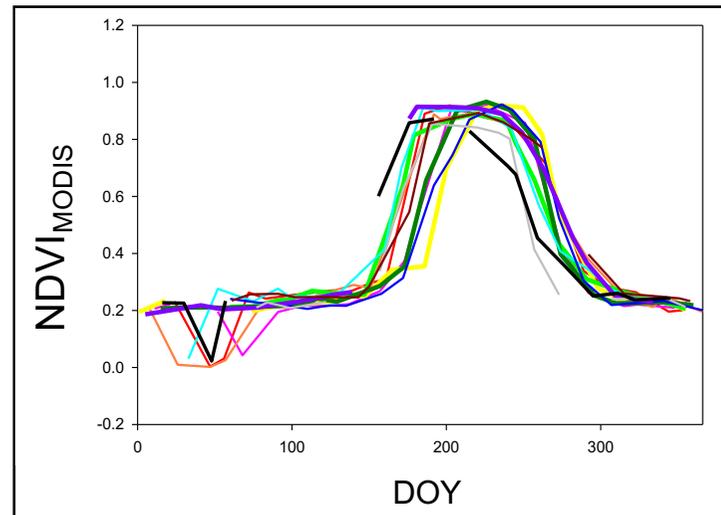
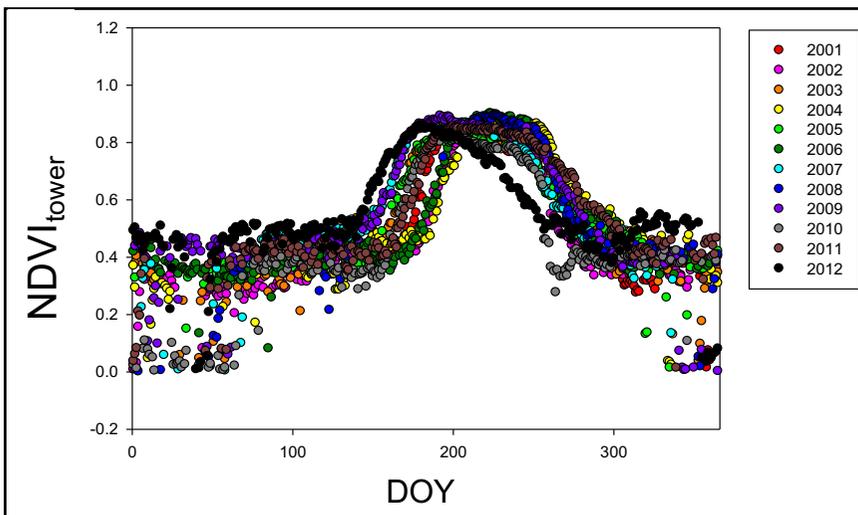
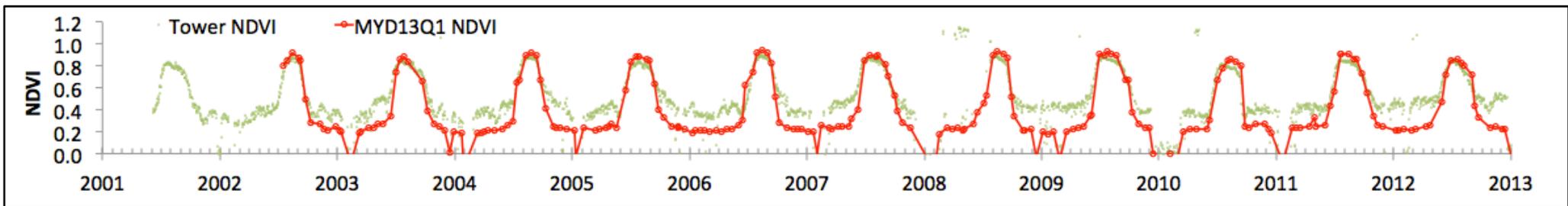
- Action items:
 - Preliminary validation exercises using the identified validation data sources
 - CEOS website update
 - Creation of an email list for information sharing
 - Appointing co-lead
 - Reconvening in a year or 1.5 years
- Remaining items:
 - Selection of a globally representative set of sites for inter-comparison

Objectives of this Workshop

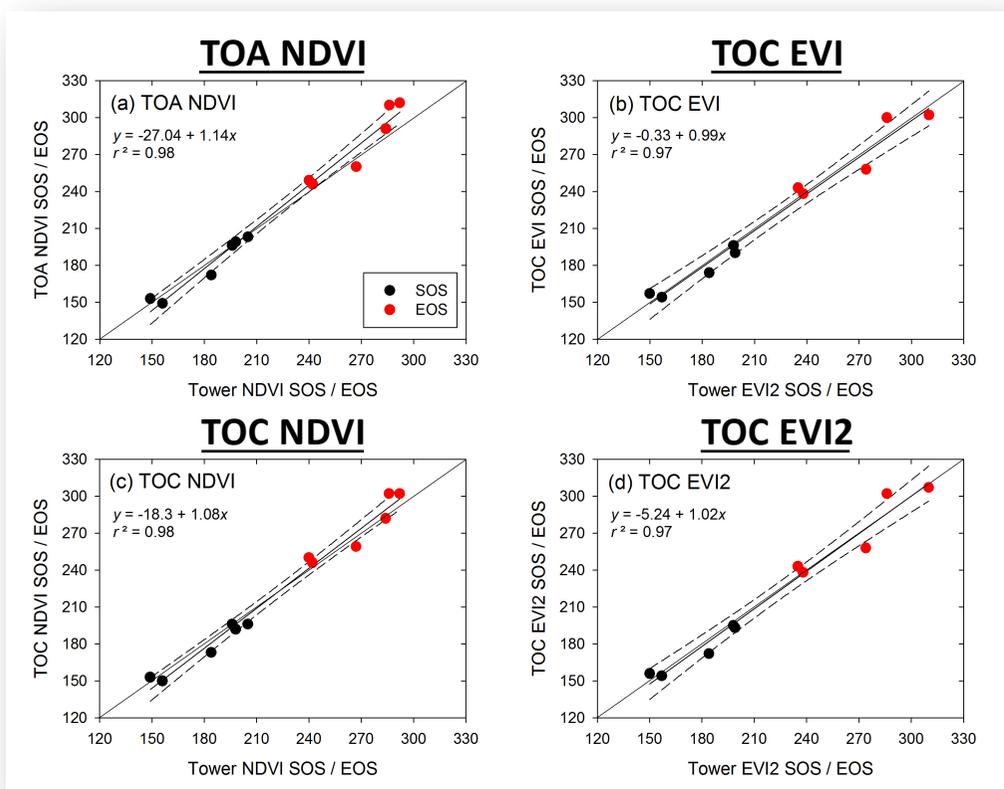
1. Review new VI products
2. Review new VI validation activities and results
3. Discuss product inter-comparison protocols to decide a set of standard metrics
 - What other validation datasets are available and suitable?
 - What validation methodologies/approaches are acceptable/agreeable?
 - What inter-comparison methods, statistics/metrics are suitable and acceptable?

VIIRS VI Product Validation: Use of Tower Radiation Flux Data

Mead Irrigated Rotation Flux Site, Nebraska, USA (US-Ne2: 41.1649, -96.4701)



Cross-Comparison of Phenological Metrics



• Data compatibility issues

- Spectral bandpasses
 - PAR (400-700 nm) vs. VIIRS red (600-680 nm)
 - NIR (700-2,800 nm) vs. VIIRS NIR (850-880 nm)
- Geometry
 - Hemispherical vs. directional
 - Reflectance vs. reflectance factor
- Footprint
 - Spatial extent of site homogeneity
 - Spatial representativeness of in situ, tower measurements

- SOS MD < 5 days
- SOS RMSE \cong 7 days

Summary of Validation Activities

- New VI or VI products
 - NBAR VIs
 - CCI (PRI) (GPP and SIF)
 - Himawari
 - Copernicus NDI product
 - JPSS VIIRS composited products

Summary of Validation Activities

- VI accuracy & uncertainty (for characterizing delta VI)
 - Field spectrometer time series data (PEN):
 - Scaling & topography (ask Aurther) issue
 - Hemisphere vs. directional
 - Opportunistic UAV LTAR data:
 - Accuracy assessment issue (Alissa)
 - Spectral bandpasses
 - Opportunistic NEON data
 - nadir vs. off-nadir (adjustment via BRDF fitting)
 - Higher resolution satellite data (e.g, Sentinel/Landsat to VIIRS/MODIS/PROBA-V/Sentinal-3, given that higher resolution satellite data are validated against ground measurements)

Summary of Validation Activities

- In situ data sources for VI time series validation
 - Fluxnet data (GPP)
 - NPN
 - Phenocam
 - PEN

- Scaling issue / foot print
- Viewing geometry (viewing angle)
- Sensor characteristic differences